

REMARKS

Claims 1-2 and 4-13 are pending. Claims 1, 6, 9, and 10 have been amended. Claims 5 and 7 have been canceled. Claims 14 and 15 have been added. Support for the amendments and added claims may be found in the Specification as filed at least in FIGs. 5-9 and related descriptions. No new matter has been added. The rejections of the claims are respectfully traversed in light of the amendments and following remarks, and reconsideration is requested.

Rejections Under 35 U.S.C. § 103

1. Chang in view of Onodera

Claims 1, 4-7, 9-10, and 11-13 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Chang (U.S. Patent No. 5,500,605) in view of Onodera et al. (U.S. Patent No. 6,133,537 hereinafter "Onodera").

Applicant submits the cited references do not disclose or suggest the combination of the elements as recited in the amended claims.

In particular, Chang discloses a "conductive probe 25 is spring-loaded and contains on its upper surface three needle-like projections 29 . . . which pierce the solder ball 15. (Chang, col.2, lines 46-53). Chang only discloses that the spring is used to provide a bias force and does not disclose or suggest that the spring contacts a solder ball or is used as a conductive contact part. Onodera does not remedy the deficiencies of Chang.

Furthermore, Applicant agrees with the Examiner that Chang does not disclose or suggest "a layer of highly electrically conductive material resistant to solder deposition . . . formed at least over a conductive contact part of the conductive contact member" as recited in Claims 1, 9, and 10. Chang discloses an electrical test apparatus and method, in particular for ball grid arrays (BGAs), which can provide "reliable connections in all cases" (Chang, col.1, lines 55-56) and "a dependable electrical contact" (Chang, col.2, lines 53-57). Chang even discloses "a needle projection for piercing a solder ball and insuring good electrical contact" (Chang, col.1, lines 53-55). Thus, Chang is directed toward the problem of providing reliable and robust electrical contact for high density BGAs. Applicant submits that Chang does not

teach the problem of solder deposition on contact members or the problem source, and there is no basis in the art for combining or modifying Chang with Onodera.

The Examiner states that "Onodera et al. teach . . . one of the first and second contact surfaces comprises an Au/Ag alloy (see Col.3 Lines 30-40)" and that "it would have been obvious to one having ordinary skill in the art at the time the invention was made to use AuAg(Pd) alloy or Au/Ag alloy, as taught by Onodera et al., in structure of Chang." (Office Action, page 3).

However, Onodera is directed to switch contacts using two pieces that consist of like materials (i.e., Au/Ag/Pd or Au/Ag) which are significantly harder than solder. The present claims are directed toward a contact member for temporarily contacting solder.

Onodera teaches away from the use of a layer consisting of: 1) gold containing a small amount of silver; or 2) an alloy of gold added with silver; or 3) a homogeneous mixture of gold added with silver. Onodera discloses the following:

Au and AuAg are so soft as showing a plastic deformation. This plastic deformation may cause a possible adhesion of the contact surface with an opposite contact surface. The adhesion of the contact surface with the opposite contact surface may cause the loss of reliability.

A development of the contact surface layer material having an anti-adhesion property has been made. . . . 1-10% by weight of Pd and 10-100 ppm of C are added to Au or the AuAg alloy to prepare the contact surface layer material, so that the electric contact superior in anti-adhesion property and contact stability is obtained. (Onodera, col.1, ll.30-45).

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The present invention provides an electric contact structure comprising a first contact surface and a second contact surface, wherein at least one of the first and second contact surfaces comprises an AuAgPd alloy including 7-16% by weight of Ag and 1-10% by weight of Pd, whereby a high anti-adhesion property and a highly stable contact resistance can be obtained particularly when the electric contacts are in non-operating state. (Onodera, col.3, lines 23-30; Abstract) (emphases added).

Thus, Onodera discloses the use of a gold/silver/palladium alloy for a contact surface layer, in particular for contacts suitable for switches and relays. Onodera teaches that AuAg without Pd may cause the loss of contact reliability and the addition of Pd is at the center of

its invention. Accordingly, Onodera teaches away from using a layer consisting of an alloy of gold and silver or a homogeneous mixture of gold added with silver.

Applicant further submits that Onodera does not teach the problem of solder deposition on contact members or the problem source. Onodera does not disclose or suggest material resistant to solder deposition but anti-adhesion characteristics between two like contact surfaces as for relay or switch devices, for example where both the moveable and fixed contacts contain a majority of gold. (Onodera, col.5, line 58-col.8, line 21). Onodera does not disclose or suggest solder or the problem of solder deposition.

Applicant also submits that Onodera is directed toward nonanalogous art remote from the claimed invention and that a person of ordinary skill in the claimed art would not look to Onodera and its related art to solve the problem treated by the claimed invention. Onodera is wholly unrelated to “a conductive contact member for establishing a temporary electric contact by being applied under a resilient force to an object to be contacted that includes solid solder” as recited in independent Claims 1, 9, and 10.

Applicant thus submits there is no teaching or suggestion in Chang and Onodera (i.e., there is no basis in the art) for combining or modifying Chang with Onodera and that Onodera does not remedy the deficiencies of Chang noted above.

In contrast, amended Claim 1 recites a “conductive contact member comprising a compression coil spring formed of a wire with a layer of highly electrically conductive material resistant to solder deposition, wherein the layer consists of gold containing a small amount of silver, contains no palladium, and is formed at least over a conductive contact part of said compression coil spring so that said conductive contact part of said compression coil spring may not be contaminated by deposition of solder from said object to be contacted.”

Amended Claim 9 similarly recites a “conductive contact member comprising a compression coil spring formed of a wire with a layer of highly electrically conductive material resistant to solder deposition, wherein the layer consists of an alloy of gold added with silver, contains no palladium, and is formed at least over a conductive contact part of said compression coil spring so that said conductive contact part of said compression coil spring may not be contaminated by deposition of solder from said object to be contacted.”

Amended Claim 10 similarly recites a “conductive contact member comprising a compression coil spring formed of a wire with a layer of highly electrically conductive material resistant to solder deposition, wherein the layer consists of a homogeneous mixture of gold added with silver, contains no palladium, and is formed at least over a conductive contact part of said compression coil spring so that said conductive contact part of said compression coil spring may not be contaminated by deposition of solder from said object to be contacted.”

Therefore, because Chang and Onodera are not properly combinable, and further because Chang and Onodera, alone or in combination, do not disclose or suggest all the limitations of amended Claims 1, 9, and 10, Claims 1, 9, and 10 are patentable over the cited references.

Claims 2, 4, 6, and 11 are dependent on Claim 1 and contain additional limitations that further distinguish them from Chang in view of Onodera. Therefore, Claims 2, 4, 6, and 11 are allowable over the cited references for at least the same reasons provided above with respect to Claim 1.

Claims 12 and 13 are dependent on Claims 9 and 10, respectively, and contain additional limitations that further distinguish them from Chang in view of Onodera. Therefore, Claims 12 and 13 are allowable over the cited references for at least the same reasons provided above for Claims 9 and 10, respectively.

2. Chang in view of Onodera and further in view of DiRenzo

Claim 2 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Chang and Onodera, as applied to Claim 1 above, and further in view of DiRenzo (U.S. Patent No. 3,599,326).

In rejecting the claims in the Office Action, the Examiner wrote in part that “DiRenzo teaches pins 12 hav[ing] a layer resistant to solder deposition formed by plating.” (Office Action page 5).

Applicant submits that DiRenzo discloses the following:

[T]he present invention contemplates a method of manufacturing printed circuit boards of the type having a plurality of contact pins projecting from one side thereof, and which pins are adapted for use as wire wrap terminals connecting board-carried wiring to external circuits. The method includes selectively coating portions of the pins . . . with a material to which solder will not adhere to maintain the portions free of solder and in condition for making of wire wrap connections, followed by subjecting the boards and pins to a batch of molten solder to connect the pins to the circuits carried by the board. (DiRenzo, col.1, ll.36-47) (emphasis added).

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Still another method for applying a solder resistant coating comprises electroplating a layer of silver about .000025 inch thick on the gold plated pin to within about one-sixteenth inch of the solder pad. Again this leaves an exposed region of gold to which the solder will adhere. The assembly is then subjected to a hydrogen sulfide enriched atmosphere, whereby the silver coating is converted to silver sulfide which will reject solder during the wave soldering operation. The silver sulfide . . . is conductive and the ensuing wire wrap connection is as effective as if made directly to the untreated gold plated pin surface. (DiRenzo, col.3, ll.22-33) (emphasis added).

Thus, DiRenzo discloses an arrangement for preventing adherence of molten solder onto portions of pins that project from a printed circuit board when the circuit board is immersed or placed over a solder bath. Gold plated pins are disclosed as being selectively electroplated with a layer of silver which is converted to a coating of silver sulfide which is resistant to solder. Portions of the pins not selectively electroplated with the layer of silver is connected to the board circuits by the molten solder. Accordingly, DiRenzo discloses a composite of two layers: a layer of silver sulfide for solder resistance over a layer of gold for solder adherence. DiRenzo does not disclose or suggest a single layer consisting of "gold containing a small amount of silver" formed over a conductive contact part of a conductive contact member, wherein said layer is formed by plating, as covered in independent Claim 1 and dependent Claim 2.

Applicant also submits that DiRenzo is directed toward nonanalogous art remote from the claimed invention and that a person of ordinary skill in the claimed art would not look to DiRenzo and its related art to solve the problem treated by the claimed invention. Applicant further submits that DiRenzo does not teach the problem of solder deposition on contact

members or the problem source. As noted above, DiRenzo is directed toward connecting pins of a printed circuit board and providing wire wrap terminal connections. DiRenzo is wholly unrelated to “a conductive contact member for establishing a temporary electric contact by being applied under a resilient force to an object to be contacted that includes solid solder” as recited in independent Claim 1.

Applicant further submits there is no teaching or suggestion in Chang, Onodera, and DiRenzo for combining or modifying the references.

Accordingly, DiRenzo does not remedy the deficiencies of Chang and Onodera noted above, and Claim 2 is dependent on Claim 1 and contains additional limitations that further distinguish it from Chang in view of Onodera and further in view of DiRenzo. Therefore, Claim 2 is allowable over the cited references for at least the same reasons provided above with respect to Claim 1.

3. Chang in view of Onodera and further in view of Loranger

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Chang in view of Onodera, as applied to Claims 1 and 7 above, and further in view of Loranger et al. (U.S. Patent No. 5,791,914 hereinafter “Loranger”).

The Examiner cites Loranger for its disclosure of a compression coil spring 11. As noted by the Examiner in the February 14, 2003 Office Action, “Loranger does not disclose a layer of highly electrically conductive material resistant to solder deposition formed at least over a conductive contact part of the contact member,” (Office Action dated 2/14/03, page 5), and thus Loranger does not remedy the deficiencies of Chang and Onodera noted above. Claim 8 is dependent on Claim 1 and contains additional limitations that further distinguish it from Chang in view of Onodera and further in view of Loranger. Therefore, Claim 8 is allowable over the cited references for at least the same reasons provided above with respect to Claim 1.

New Claims

For the reasons set forth above, Applicant believes new Claims 14 and 15 are allowable over the cited references, which recite in part a “conductive contact member comprising a needle member with a layer of highly electrically conductive material resistant to solder deposition, wherein the layer consists of an alloy of gold added with silver, contains no palladium, and is formed at least over a conductive contact part of said needle member so that said conductive contact part of said needle member may not be contaminated by deposition of solder from said object to be contacted” and “conductive contact member comprising a cylindrical rod member with a layer of highly electrically conductive material resistant to solder deposition, wherein the layer consists of an alloy of gold added with silver, contains no palladium, and is formed at least over a conductive contact part of said rod member so that said conductive contact part of said rod member may not be contaminated by deposition of solder from said object to be contacted”, respectively.

Applicant submits that there is no suggestion in Chang, Onodera, and DiRenzo for combining or modifying the references, but even if combined, the references do not disclose or suggest all the elements of the new independent claims.

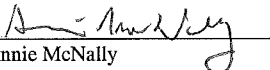
CONCLUSION

For the above reasons, Applicant believes pending Claims 1-2, 4, 6, and 8-15 are now in condition for allowance and allowance of the Application is hereby solicited. If the Examiner has any questions or concerns, the Examiner is hereby requested to telephone Applicant's Attorney at (202) 654-4500.

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Electronically Filed by:


Annie McNally

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Respectfully submitted,

/ David S. Park /

David S. Park
Attorney for Applicant(s)
Reg. No. 52,094